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HONG KONG EXAMINATIONS AND ASSESSMENT AUTHORITY
HONG KONG DIPLOMA OF SECONDARY EDUCATION EXAMINATION 2012

MATHEMATICS Compulsory Part
PAPER 2

11.30 am – 12.45 pm (1¼ hours)

INSTRUCTIONS

1. Read carefully the instructions on the Answer Sheet. After the announcement of the start of the examination, you should first stick a barcode label and insert the information required in the spaces provided. No extra time will be given for sticking on the barcode label after the 'Time is up' announcement.

2. When told to open this book, you should check that all the questions are there. Look for the words '**END OF PAPER**' after the last question.

3. All questions carry equal marks.

4. **ANSWER ALL QUESTIONS**. You are advised to use an HB pencil to mark all the answers on the Answer Sheet, so that wrong marks can be completely erased with a clean rubber. You must mark the answers clearly; otherwise you will lose marks if the answers cannot be captured.

5. You should mark only **ONE** answer for each question. If you mark more than one answer, you will receive **NO MARKS** for that question.

6. No marks will be deducted for wrong answers.

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Not to be taken away before the end of the examination session

There are 30 questions in Section A and 15 questions in Section B.
The diagrams in this paper are not necessarily drawn to scale.
Choose the best answer for each question.

Section A

1. $\dfrac{(2x^4)^3}{2x^5} =$

   A. $3x^2$.

   B. $3x^7$.

   C. $4x^7$.

   D. $4x^{59}$.

2. $(4x+y)^2-(4x-y)^2 =$

   A. 0 .

   B. $2y^2$.

   C. $8xy$.

   D. $16xy$.

3. If p and q are constants such that $x^2+p\equiv(x+2)(x+q)+10$, then $p=$

   A. -4 .

   B. -2 .

   C. 6 .

   D. 10 .

4. If k is a constant such that $x^3+4x^2+kx-12$ is divisible by $x+3$, then $k=$

A. -25.

B. -1.

C. 1.

D. 17.

5. If $m+2n+6=2m-n=7$, then $n=$

A. -4.

B. -1.

C. 3.

D. 11.

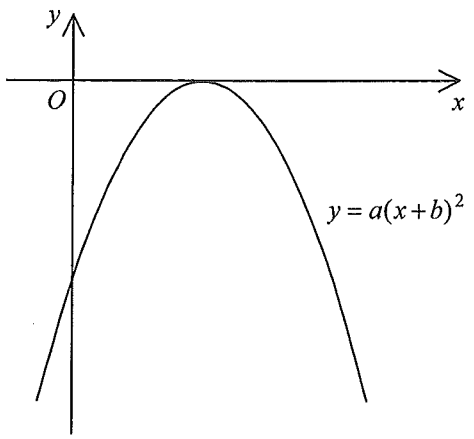
6. The figure shows the graph of $y=a(x+b)^2$, where a and b are constants. Which of the following is true?

A. $a>0$ and $b>0$

B. $a>0$ and $b<0$

C. $a<0$ and $b>0$

D. $a<0$ and $b<0$



7. The solution of $15+4x<3$ or $9-2x>1$ is

A. $x<-3$.

B. $x>-3$.

C. $x<4$.

D. $x>4$.

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8. In a company, 37.5% of the employees are female. If 60% of the male employees and 80% of the female employees are married, then the percentage of married employees in the company is

A. 32.5% .

B. 45% .

C. 55% .

D. 67.5% .

9. If x and y are non-zero numbers such that $\frac{6x+5y}{3y-2x}=7$, then $x:y=$

A. 4:5 .

B. 4:13 .

C. 5:4 .

D. 13:4 .

10. It is given that y partly varies directly as x^2 and partly varies inversely as x . When $x=1$, $y=-4$ and when $x=2$, $y=5$. When $x=-2$, $y=$

A. −11 .

B. −5 .

C. 5 .

D. 11 .

11. Mary performs a typing task for 7 hours. Her average typing speeds for the first 3 hours and the last 4 hours are 63 words per minute and 56 words per minute respectively. Find her average typing speed for the 7 hours.

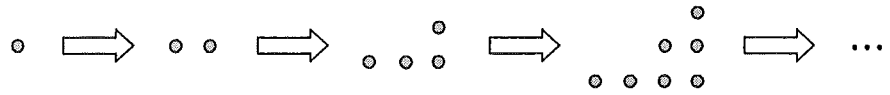
A. 17 words per minute

B. 35 words per minute

C. 59 words per minute

D. 60 words per minute

12. In the figure, the 1st pattern consists of 1 dot. For any positive integer n, the $(n+1)$ th pattern is formed by adding n dots to the nth pattern. Find the number of dots in the 8th pattern.



A. 22

B. 29

C. 36

D. 37

13. $0.0322515 =$

A. 0.032 (correct to 3 significant figures).

B. 0.0322 (correct to 4 decimal places).

C. 0.03225 (correct to 5 significant figures).

D. 0.032252 (correct to 6 decimal places).

14. The length of a piece of thin string is measured as 25 m correct to the nearest m. If the string is cut into n pieces such that the length of each piece is measured as 5 cm correct to the nearest cm, find the greatest possible value of n.

A. 445

B. 566

C. 567

D. 650

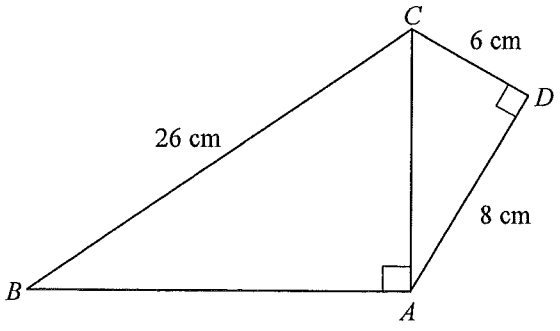
15. In the figure, the area of quadrilateral $ABCD$ is

A. 144 cm^2.

B. 160 cm^2.

C. 178 cm^2.

D. 288 cm^2.



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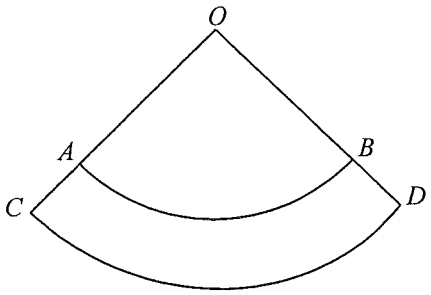
16. In the figure, OAB and OCD are sectors with centre O. If $\overset{\frown}{AB} = 12\pi$ cm, $\overset{\frown}{CD} = 16\pi$ cm and $OA = 30$ cm, then $AC =$

A. 5 cm.

B. 10 cm.

C. 20 cm.

D. 40 cm.



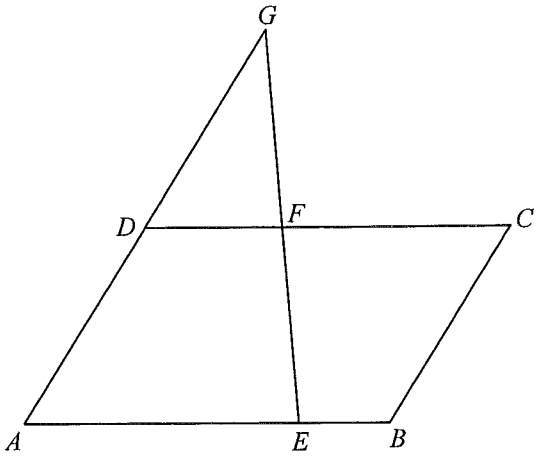
17. In the figure, $ABCD$ is a parallelogram. E and F are points lying on AB and CD respectively. AD produced and EF produced meet at G. It is given that $DF : FC = 3 : 4$ and $AD : DG = 1 : 1$. If the area of ΔDFG is 3 cm^2, then the area of the parallelogram $ABCD$ is

A. 12 cm^2.

B. 14 cm^2.

C. 18 cm^2.

D. 21 cm^2.



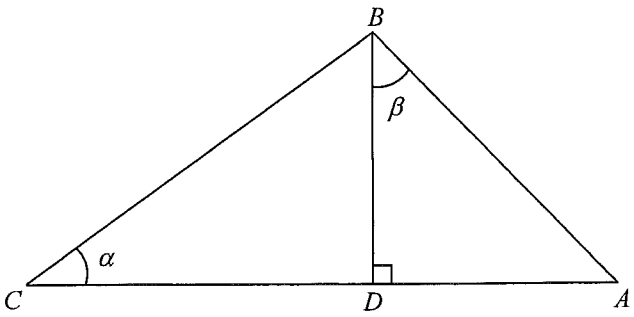
18. In the figure, D is a point lying on AC such that BD is perpendicular to AC. If $BC = \ell$, then $AB =$

A. $\dfrac{\ell \sin\alpha}{\cos\beta}$.

B. $\dfrac{\ell \sin\beta}{\cos\alpha}$.

C. $\dfrac{\ell \cos\alpha}{\sin\beta}$.

D. $\dfrac{\ell \cos\beta}{\sin\alpha}$.



19. $\dfrac{\cos 60°}{1-\cos(90°-\theta)}+\dfrac{\cos 240°}{1-\cos(270°-\theta)}=$

A. $\dfrac{1}{\cos^2\theta}$.

B. $\dfrac{\cos\theta}{\tan\theta}$.

C. $\dfrac{\tan\theta}{\cos\theta}$.

D. $\dfrac{1}{\cos\theta\tan\theta}$.

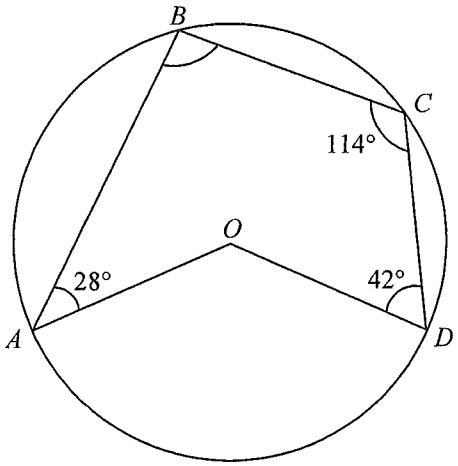
20. In the figure, O is the centre of the circle $ABCD$. If $\angle BAO = 28°$, $\angle BCD = 114°$ and $\angle CDO = 42°$, then $\angle ABC =$

A. $90°$.

B. $96°$.

C. $100°$.

D. $138°$.



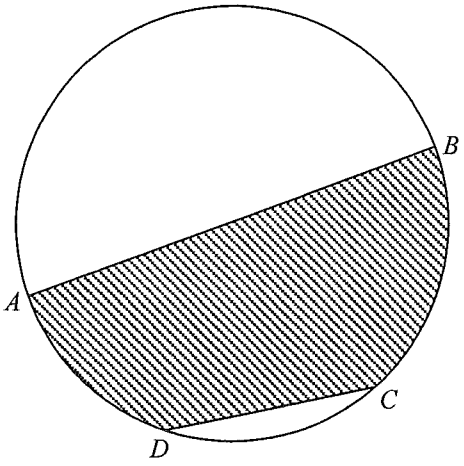
21. In the figure, AB is a diameter of the circle $ABCD$. If $AB = 12\,\text{cm}$ and $CD = 6\,\text{cm}$, then the area of the shaded region is

A. $(12\pi - 9)\,\text{cm}^2$.

B. $(12\pi + 9)\,\text{cm}^2$.

C. $(12\pi - 9\sqrt{3})\,\text{cm}^2$.

D. $(12\pi + 9\sqrt{3})\,\text{cm}^2$.



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22. Which of the following statements about a regular 12-sided polygon are true?

I. Each exterior angle is $30°$.
II. Each interior angle is $150°$.
III. The number of axes of reflectional symmetry is 6 .

A. I and II only

B. I and III only

C. II and III only

D. I, II and III

23. The rectangular coordinates of the point P are $(-3, -3\sqrt{3})$. If P is rotated anticlockwise about the origin through $90°$, then the polar coordinates of its image are

A. $(3, 150°)$.

B. $(3, 330°)$.

C. $(6, 150°)$.

D. $(6, 330°)$.

24. If P is a moving point in the rectangular coordinate plane such that the distance between P and the point $(20, 12)$ is equal to 5 , then the locus of P is a

A. circle.

B. square.

C. parabola.

D. triangle.

25. In the figure, the equations of the straight lines L_1 and L_2 are $ax+y=b$ and $cx+y=d$ respectively. Which of the following are true?

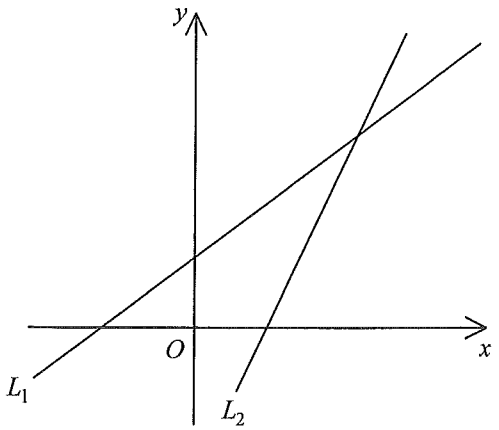
I. $a<0$
II. $a<c$
III. $b>d$
IV. $ad>bc$

A. I, II and III only

B. I, II and IV only

C. I, III and IV only

D. II, III and IV only



26. In the figure, the radius of the circle and the coordinates of the centre are r and (h,k) respectively. Which of the following are true?

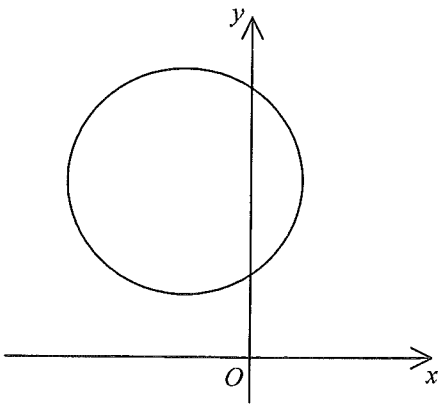
I. $h+k>0$
II. $r-h>0$
III. $r-k>0$

A. I and II only

B. I and III only

C. II and III only

D. I, II and III



27. 9★◆ is a 3-digit number, where ★ and ◆ are integers from 0 to 9 inclusive. Find the probability that the 3-digit number is divisible by 5.

A. $\frac{1}{5}$

B. $\frac{7}{33}$

C. $\frac{20}{99}$

D. $\frac{19}{100}$

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28. The stem-and-leaf diagram below shows the distribution of the ages of a group of members in a recreational centre.

Stem (tens)	Leaf (units)							
5	0	5	6	6	8			
6	1	4	5	5	7	8	8	9
7	3	4	4	6	7	9		
8								
9	1							

A member is randomly selected from the group. Find the probability that the selected member is not under the age of 74 .

A. 0.2

B. 0.3

C. 0.7

D. 0.8

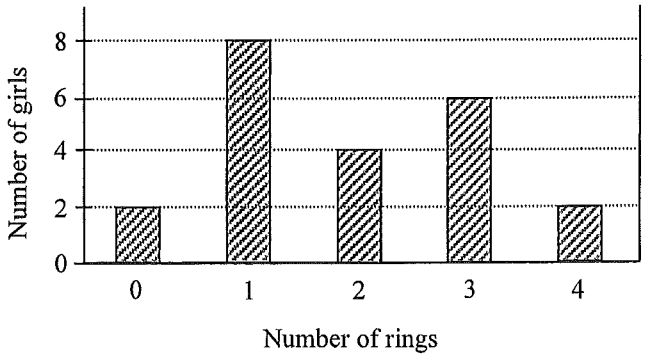
29. The bar chart below shows the distribution of the numbers of rings owned by the girls in a group. Find the standard deviation of the distribution correct to 2 decimal places.

A. 1.04

B. 1.16

C. 1.19

D. 2.09



30. Consider the following data:

19 10 12 12 13 13 14 15 16 m n

If both the mean and the median of the above data are 14 , which of the following are true?

I. $m \geq 14$
II. $n \leq 16$
III. $m+n=30$

A. I and II only

B. I and III only

C. II and III only

D. I , II and III

Section B

31. The H.C.F. and the L.C.M. of three expressions are ab^2 and $4a^4b^5c^6$ respectively. If the first expression and the second expression are $2a^2b^4c$ and $4a^4b^2c^6$ respectively, then the third expression is

A. ab^2 .

B. ab^5 .

C. $2ab^2c$.

D. $2ab^5c$.

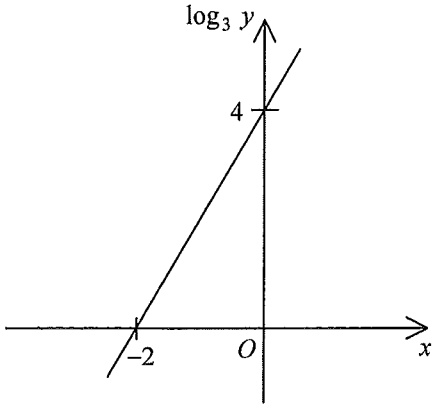
32. The graph in the figure shows the linear relation between x and $\log_3 y$. If $y = mn^x$, then $n =$

A. $\frac{1}{81}$.

B. $\frac{1}{9}$.

C. 9 .

D. 81 .



33. $AD0000002012_{16} =$

A. $(10)16^{11} + (13)16^{10} + 8210$.

B. $(10)16^{12} + (13)16^{11} + 131360$.

C. $(11)16^{11} + (14)16^{10} + 8210$.

D. $(11)16^{12} + (14)16^{11} + 131360$.

34. Let $f(x)$ be a quadratic function. If the coordinates of the vertex of the graph of $y = f(x)$ are $(3, -4)$, which of the following must be true?

A. The roots of the equation $f(x) = 0$ are integers.

B. The roots of the equation $f(x) - 3 = 0$ are rational numbers.

C. The roots of the equation $f(x) + 4 = 0$ are real numbers.

D. The roots of the equation $f(x) + 5 = 0$ are nonreal numbers.

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35. $i^3(\beta i - 3) =$

A. $\beta + 3i$.

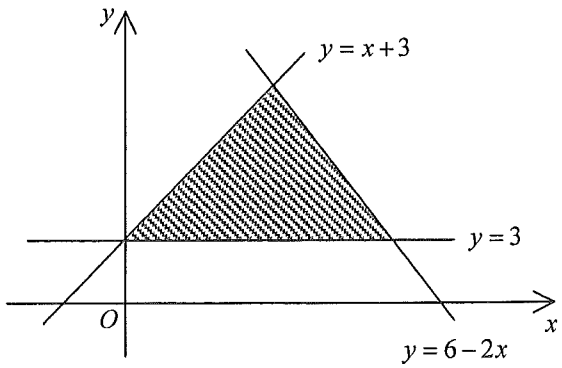
B. $\beta - 3i$.

C. $-\beta + 3i$.

D. $-\beta - 3i$.

36. The figure shows a shaded region (including the boundary). If (h, k) is a point lying in the shaded region, which of the following are true?

I. $k \geq 3$
II. $h - k \geq -3$
III. $2h + k \leq 6$



A. I and II only

B. I and III only

C. II and III only

D. I, II and III

37. Let a_n be the nth term of an arithmetic sequence. If $a_{18} = 26$ and $a_{23} = 61$, which of the following are true?

I. $a_{14} < 0$
II. $a_1 - a_2 < 0$
III. $a_1 + a_2 + a_3 + \cdots + a_{27} > 0$

A. I and II only

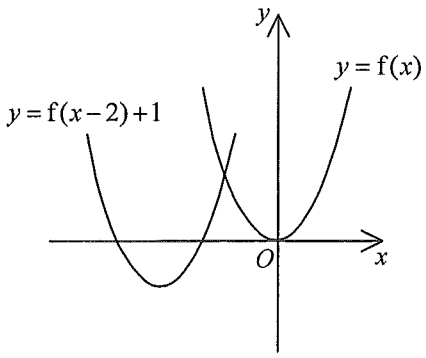
B. I and III only

C. II and III only

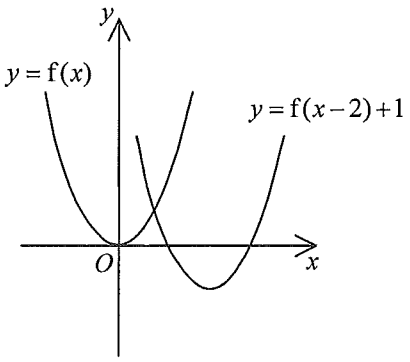
D. I, II and III

38. Which of the following may represent the graph of $y = f(x)$ and the graph of $y = f(x-2)+1$ on the same rectangular coordinate system?

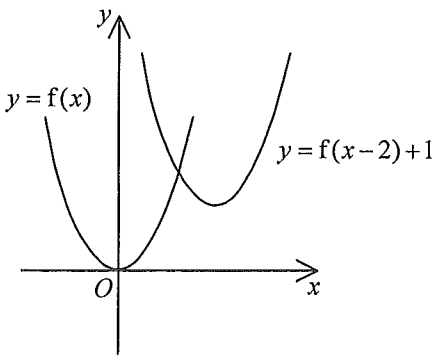
A.



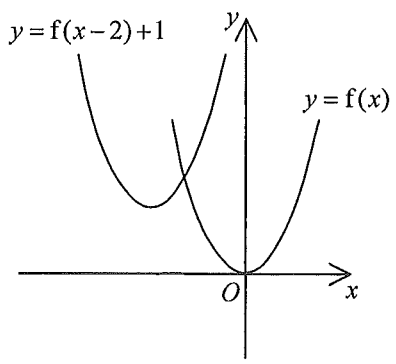
B.



C.



D.



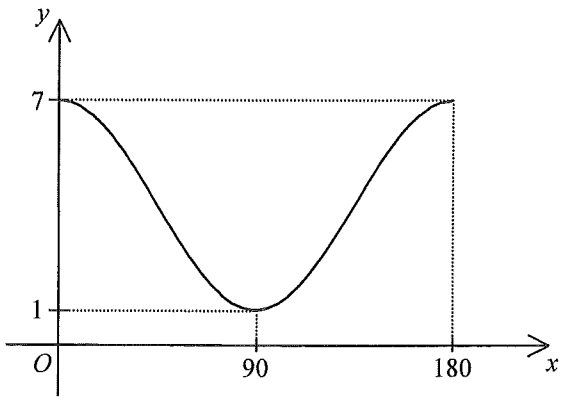
39. The figure shows

A. the graph of $y = 1+3\cos\frac{x^\circ}{2}$.

B. the graph of $y = 1+3\cos 2x^\circ$.

C. the graph of $y = 4+3\cos\frac{x^\circ}{2}$.

D. the graph of $y = 4+3\cos 2x^\circ$.



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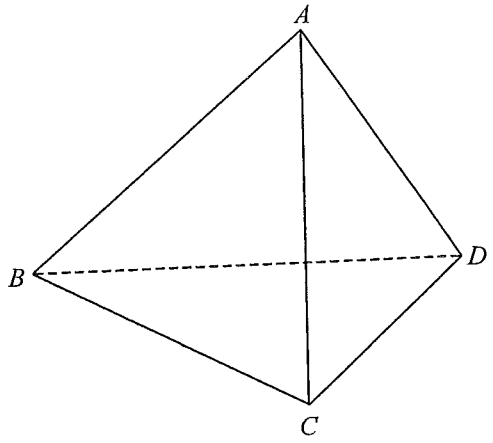
40. The figure shows a regular tetrahedron $ABCD$. Find the angle between the plane ABC and the plane BCD correct to the nearest degree.

A. 48°

B. 53°

C. 60°

D. 71°



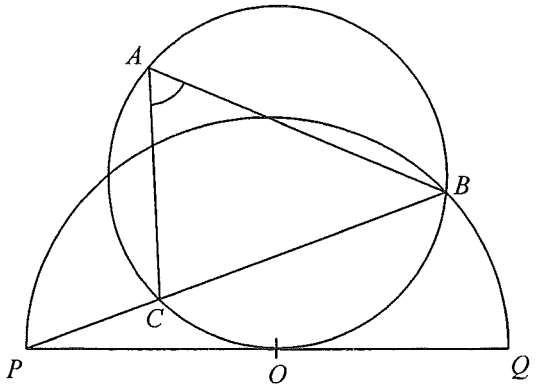
41. In the figure, PQ is the tangent to the circle ABC at O, where O is the centre of the semicircle PBQ. It is given that BCP is a straight line. If $\angle BPQ = 12°$, then $\angle BAC =$

A. 18°.

B. 24°.

C. 36°.

D. 54°.



42. Find the range of values of k such that the circle $x^2 + y^2 + 2x - 4y - 13 = 0$ and the straight line $x - y + k = 0$ intersect at two distinct points.

A. $-9 < k < 3$

B. $-3 < k < 9$

C. $k < -9$ or $k > 3$

D. $k < -3$ or $k > 9$

43. A drama club is formed by 12 boys and 8 girls. If a team of 5 students is selected from the club to participate in a competition and the team consists of at least one girl, how many different teams can be formed?

A. 3960

B. 14712

C. 15448

D. 15504

44. A box contains six balls numbered 7, 8, 8, 9, 9 and 9 respectively. John repeats drawing one ball at a time randomly from the box without replacement until the number drawn is 9. Find the probability that he needs exactly three draws.

A. $\frac{1}{2}$

B. $\frac{1}{6}$

C. $\frac{1}{8}$

D. $\frac{3}{20}$

45. Let m_1, r_1 and v_1 be the mean, the range and the variance of a group of numbers $\{x_1, x_2, x_3, \ldots, x_{100}\}$ respectively. If m_2, r_2 and v_2 are the mean, the range and the variance of the group of numbers $\{x_1, x_2, x_3, \ldots, x_{100}, m_1\}$ respectively, which of the following must be true?

I. $m_1 = m_2$

II. $r_1 = r_2$

III. $v_1 = v_2$

A. I and II only

B. I and III only

C. II and III only

D. I, II and III

END OF PAPER